CoiNel Technology Solutions LLP®

LPC2148 DEV BOARD

User Manual

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1. INTRODUCTION

ARM7 LPC2148 is a 16/32 bit ARM7TDMI-S Core Microcontroller from Philips (NXP). LPC2148 includes built in peripherals such as USB, ADC, DAC, Timer/Counter, PWM, Capture, RTC, I2C, SPI, UART etc.

LPC2148 Dev Board is optimized to save development time in typical embedded control applications. The Dev Board is an extension of a basic header board and has an important peripheral interface assembled for evaluation and testing. About 20 IO are connected via standard 2.54mm berg connectors (This can be used to connect graphical LCD, 4x4 Matrix Keyboard or other interface as required).

The functional details of the board are as follows:

- 16/32 Bit ARM7TDMI-S MCU No.LPC2148 from Philips (NXP)
- Has RS232 Communication Circuit for 2 Channels (UART0 and UART1).
- Has micro SD card connectivity.
- USB device Option.
- Has EEPROM interface using I2C.
- Has PS2 keyboard interface.
- Has audio Interface.
- Analog input via AD0.1
- I/O pin out for different interfaces.
- Onboard 16*2 LCD.
- Onboard 7 segment displays via I2C.
- On Board Graphical LCD Connectivity option. (Can also be used as GP IO)
- On Board 4x4 matrix keypad Connector. (Can also be used as general purpose IO)
- On Board Temperature Sensor connected to AD0.2.
- On Board Buzzer and Relay.
- Onboard Reset and ISP Switches.
- On Board Power Supply Circuit for +5V and +3.3V (USB or external power Source input options)
- On Board 12 MHz Oscillator.

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- 32.768 KHz Clock for RTC. Option for a CMOS Battery.
- Onboard 20 pin JTAG connector for debugging/programming applications.
- LED for Power Supply, USB and Test LED.
- Power Supply – DC input 7.5 - 9V/ 500mA - 1A.
- Board Dimensions 125 x 139 mm_2. Material: FR4, Finish: ENIG.

2. HANDLING WARNINGS

- ✓ The Kit must not be subjected to high electrostatic potentials.
- ✓ General practice for working with static sensitive devices should be followed when working with the LPC2148 DEV Board.
- ✓ Board must always be handled at properly designated work areas.
- ✓ When not being worked on, the board must be enclosed in the box and stored safely.
- ✓ Avoid touching the circuits or components.
- ✓ Stacking of circuit boards and assemblies should be avoided to prevent physical damage.

3. KIT DELIVERABLES

- LPC2148 DEV Board.
- USB Cable.
- CD that contains, KEIL evaluation version installer, Flash Magic Installer, H JTAG installer schematics, user manual and related documents, hex files for various peripherals, Keil project and workspace for implementing peripherals and few example project codes.

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4. BOARD USE REQUIREMENTS

To test and evaluate the board, we recommend the following configurations

- PC with 2.0 GHz or higher CPU, 512 MB or above RAM, USB Port, Serial Port. (Will need a Parallel Port if a Parallel JTAG is being used)
- Operating System (We recommend Windows XP, since most of our testing is done on same platform, although other OS can also be used)
- Integrated Development Environment (We recommend Keil 4. Other compatible IDE can be used).
- Debugging/Programming Tool (We recommend HJTAG if Parallel Port JTAG is used, CoiNel ARM USB JTAG has been checked on Rowley Crossworks).
  Known Issue: CoiNel ARM USB JTAG does not work for LPC2148 on Kiel UVision

- To test all the features of the board, you would also require a USB Cable (A to B), a Micro SD Card, Speakers or Headphones, PS2 Keyboard, Serial cable and DC power adapter (7.5V-9V/1Amp DC).
  The board can also be powered by USB and hence use of DC power adapter is not always required.
- 4x4 matrix keyboard and graphical LCD can also be tested. These boards are sold separately and can be purchased at www.coineltech.com/shop

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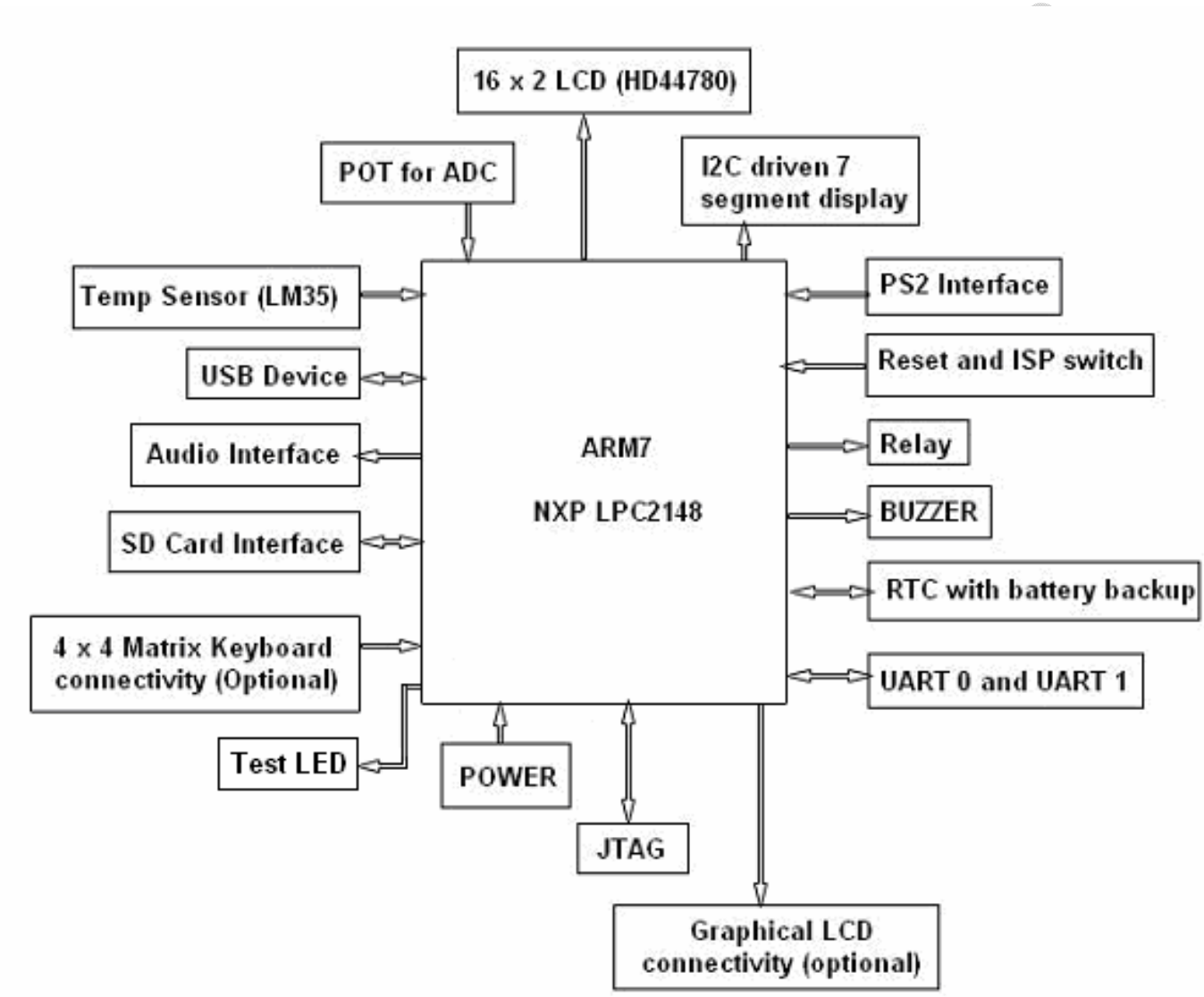
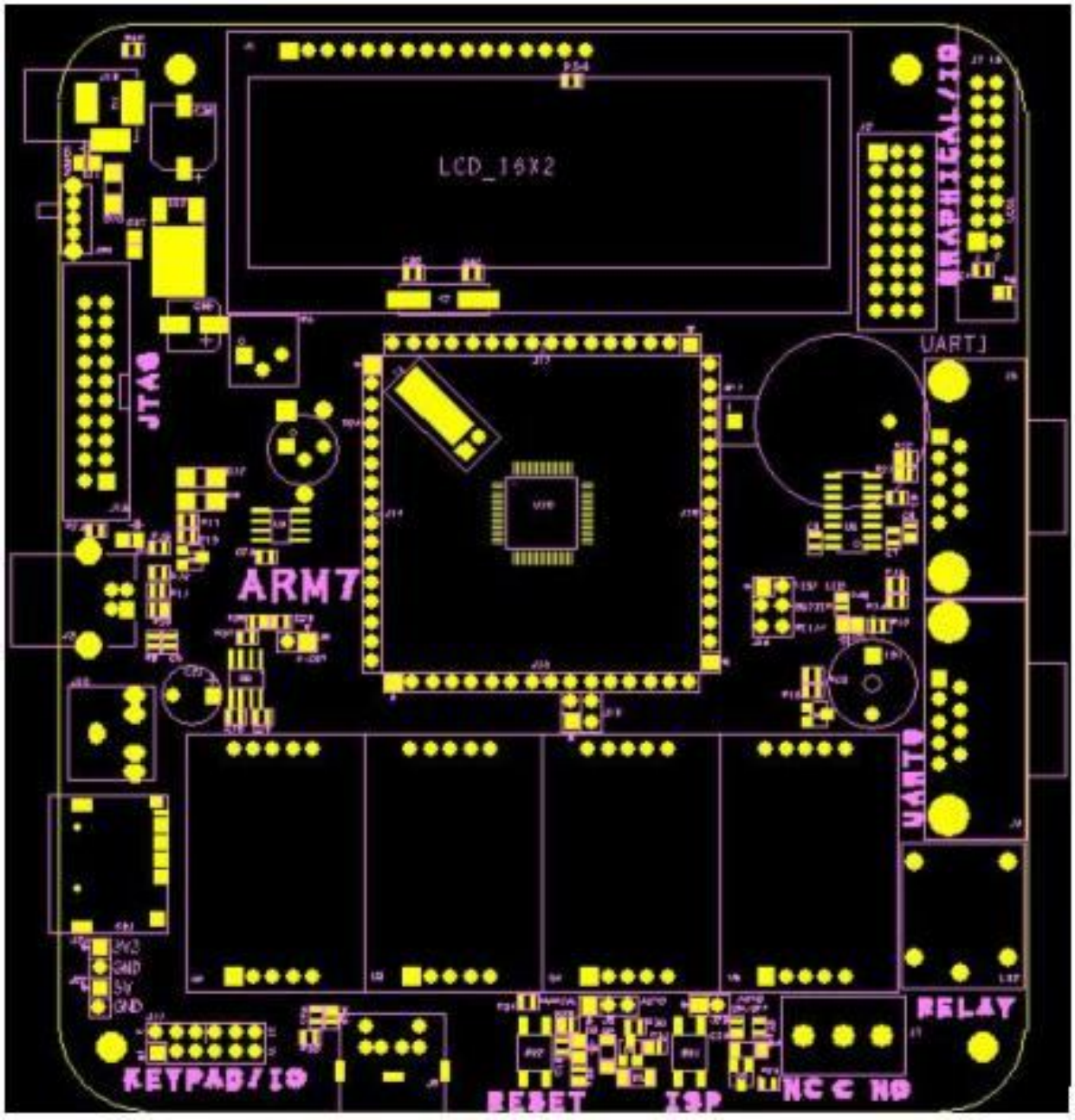
5. FUNCTIONAL BLOCK DIAGRAM OF LPC2148 DEV BOARD

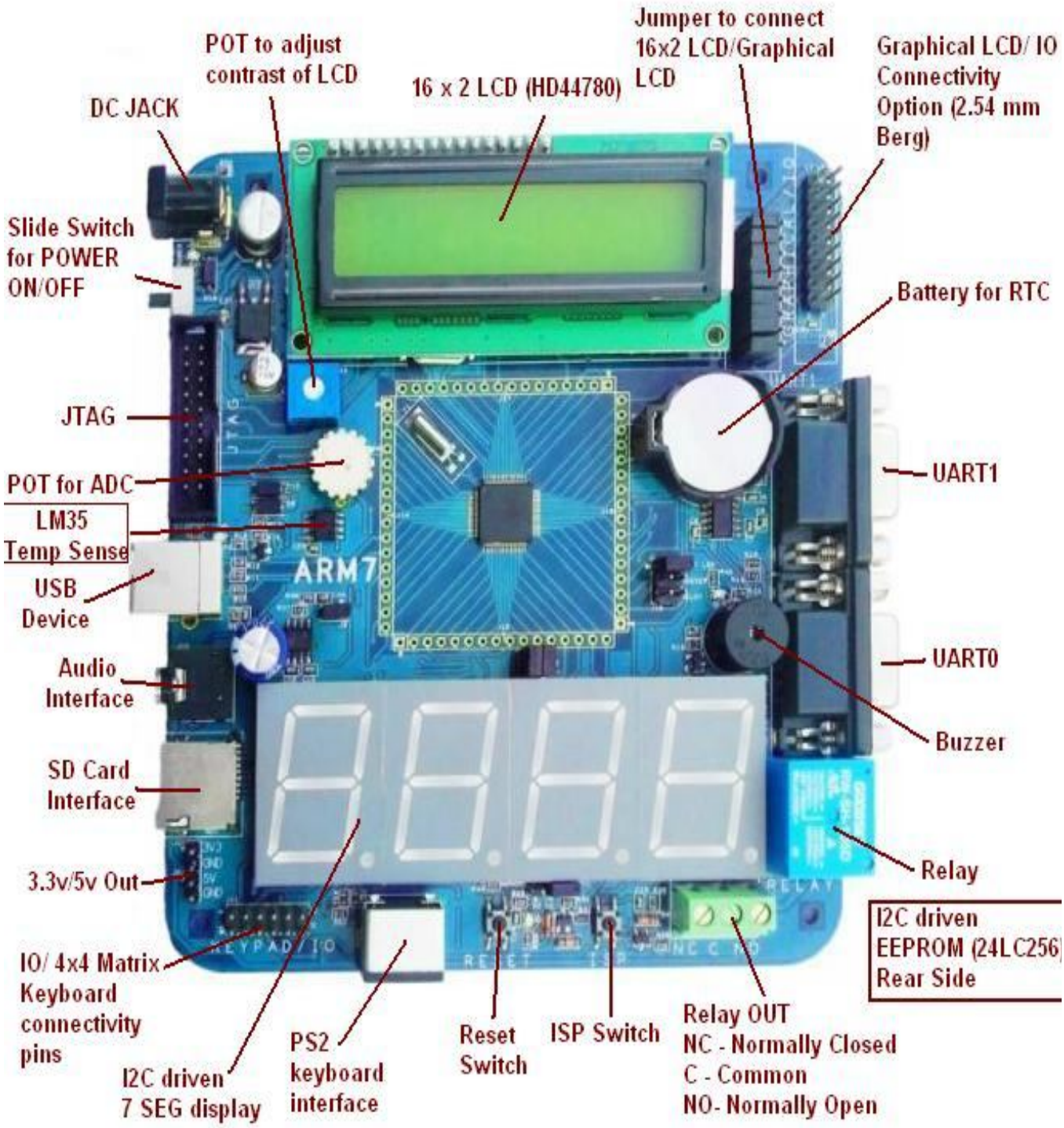


6. BOARD LAYOUT



TOP VIEW

7. HARDWARE RESOURCES

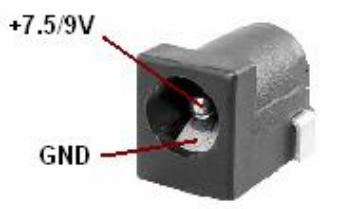


8. IO CONNECTOR DESCRIPTION

The details of the IO connections are as follows

8.1. DC Power Input

The Power supply to be used has to be 7.5V to 9V DC, 1Amp. The DC jack connectivity details are shown in the figure.



A slide switch is provided for power ON/OFF control. The slide switch is useful only when an external DC adapter is used. When USB is used to power the board, the switch condition will not have any effect on the power input.

When using the adapter, sliding the switch towards the arrow shown in figure will turn the board ON.

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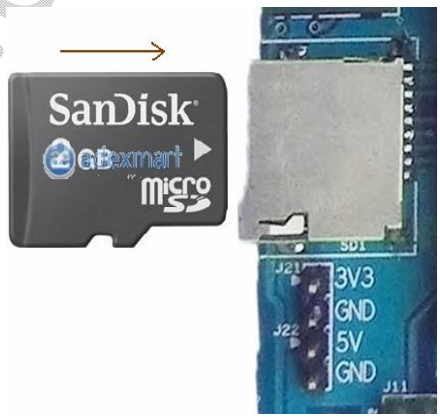
8.2. JTAG 20 Pin Box Header

The box header will be used to connect the JTAG for Debug/Programming. A 20 Pin IO Cable can be connected here which connects from a Parallel/USB JTAG. You can buy the Parallel or USB JTAG at http://www.coineltech.com/shop

8.3. Micro SD Card Connector

The correct way of inserting the SD card is given below. Pressing the card in the direction shown will lock the card. Make sure the card is properly inserted.



Note: To remove the card, press the card gently in the same direction shown above and then letting it loose. The card will easily pop out and can be removed.

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8.4. AUDIO JACK

Audio jack is provided for plug & play audio. The audio connectivity is via internal DAC. The DAC has a jumper (J9) just in case you want to connect the DAC output to other devices.

8.5. USB CONNECTIONS

The USB provided can be used as an End Device.

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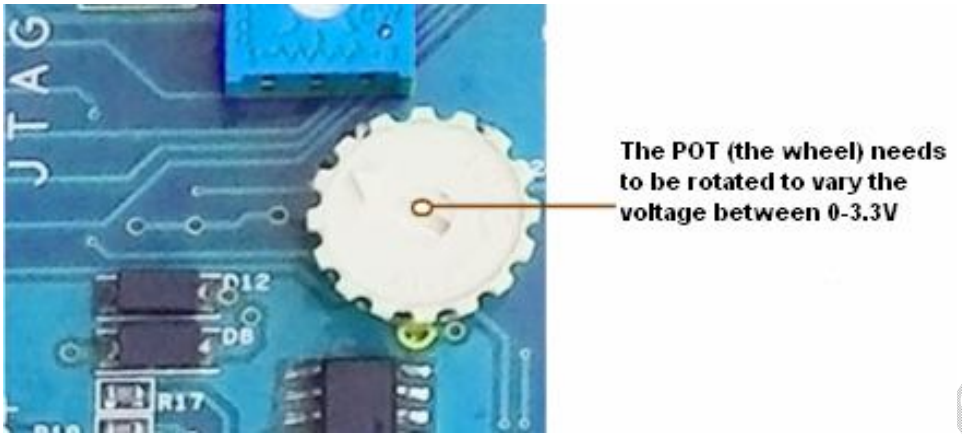
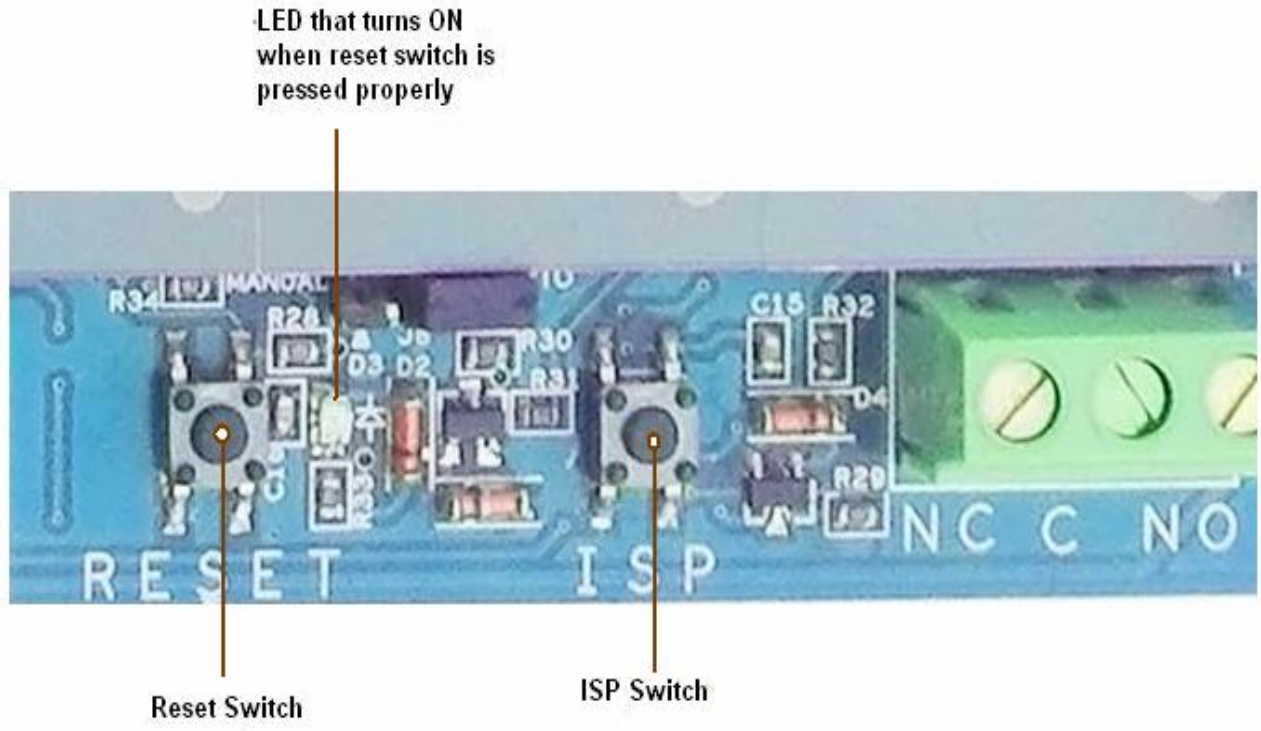
8.6. Analog Input



The POT is connected to AD0.1

8.7. Reset and ISP Switch

The reset switch can be used for resetting the CPU and ISP (In system programming) switch will be used during external interrupt/programming. The details of programming LPC2148 in ISP mode is given in detail in programming section.



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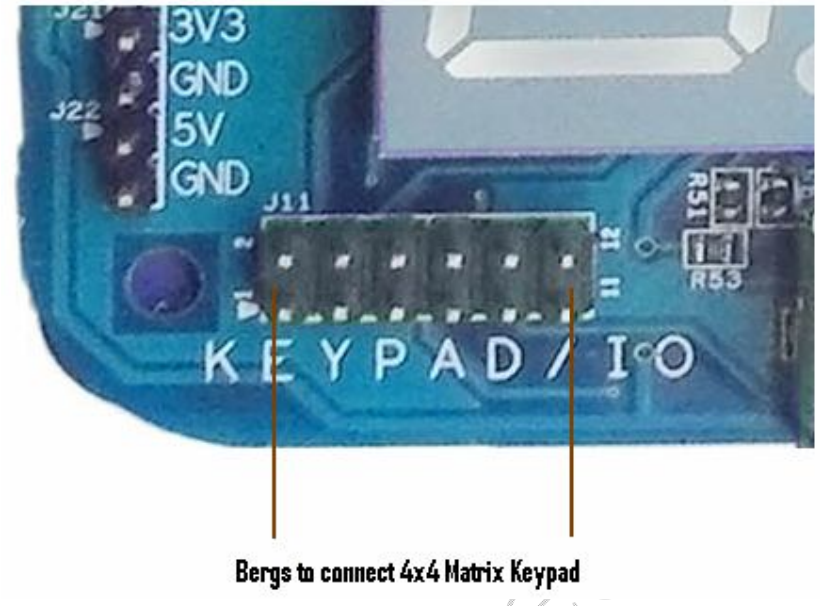
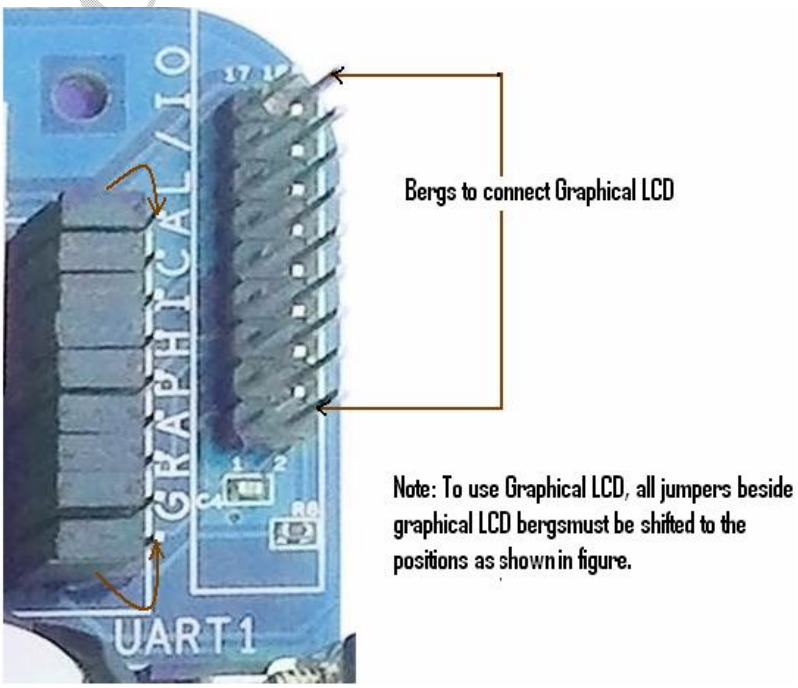
8.8. 4x4 Matrix Keypad connector bergs



Note: Apart from connecting 4x4 matrix keypad, these bergs can also be used as IO pins for other applications.

8.9. Graphical LCD connector bergs


GRAPHICAL I/O
UART1
Bergs to connect Graphical LCD
Note: To use Graphical LCD, all jumpers beside graphical LCD bergsmust be shifted to the positions as shown in figure.

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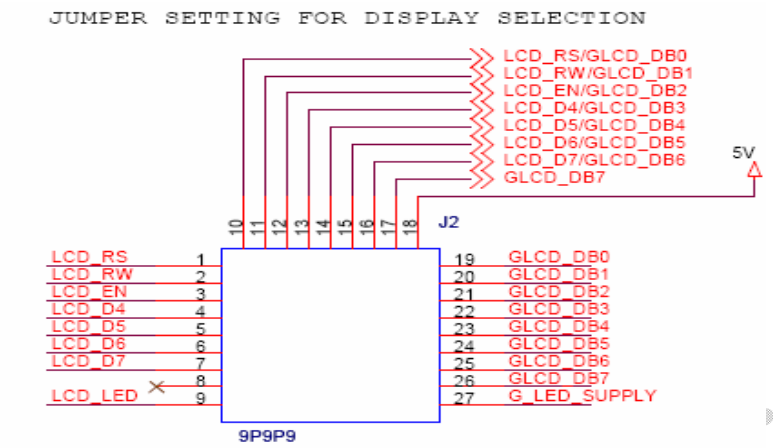
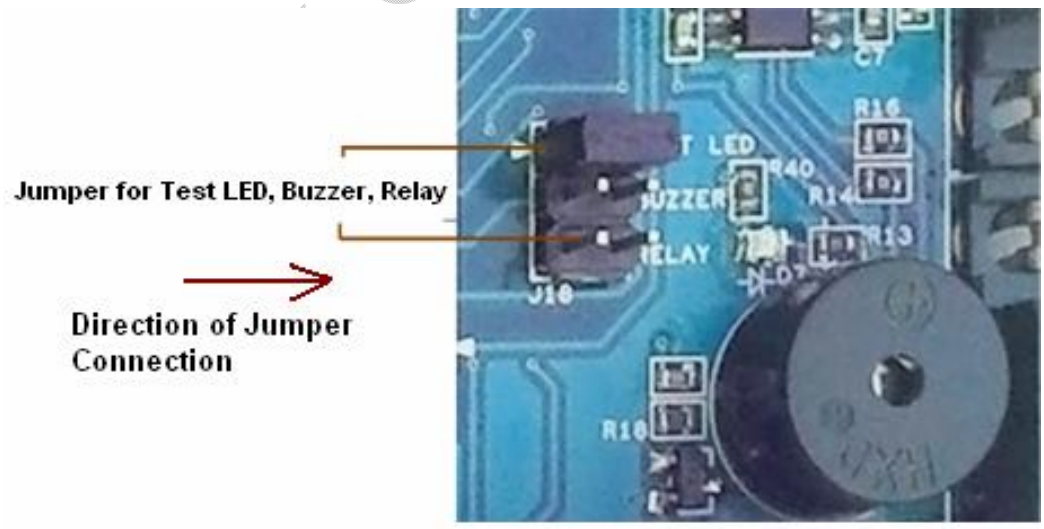


Note: Apart from connecting Graphical LCD, these bergs can also be used as IO pins for other applications.

8.10. Jumper connections for TEST LED, BUZZER and RELAY



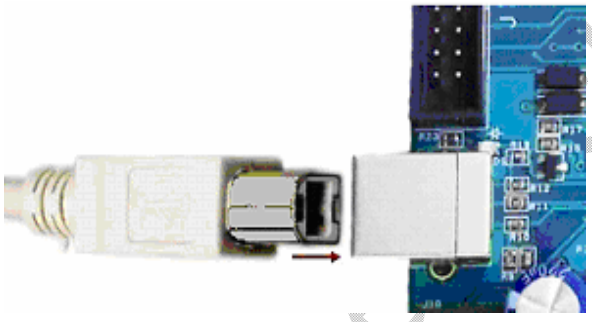
The test led, buzzer and relay are connected via port pin P0.10.

9. VALIDATING LPC2148 DEV BOARD

9.1. Powering the Board

The board can be powered using an adapter or through the USB. Connect the adapter (7.5V-9V/ 1 Amp) to the DC Jack provided and slide the switch towards ON Position. The details are shown below.

You can also power the board using USB by connecting the USB A to B Connector as shown. The other side of the cable is connected to PC. When the Power is applied, the POWER LED (D11 beside the DC Jack) will turn ON indicating board power up.



9.2. TESTING FOR BOARD WORKING

The LPC2148 DEV Board comes with the preloaded program to test various peripherals. When you power the board for the first time,

1. After about 3 seconds. LCD will be initialized and will Display “CoiNel” on first line and ”coineltech.com” on second line.

   Note:

   - There is a delay of 3 seconds as there is a code written for graphical LCD initialization before 16x2 LCD initialization. If you have brought a graphical LCD, you can shift pins of J2, reset the controller by pressing reset switch and check data displayed on graphical LCD.

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- In case you have checked for graphical LCD working, switch off the board, shift J2 back for 16 x 2 LCD and restart the board. This is done as other peripheral checking information is displayed only on 16 x 2 LCD.

2. EEPROM Data will be checked and the corresponding messages will be displayed on 16 x 2 LCD.

   Note : If the EEPROM read/write is correctly executed, the Test LED also turns ON provided J18 is connected to Test LED

3. 7 Segment Test message will be displayed.
   An up counter from 0 to 10 will be displayed on 7 segment displays.

4. SD Card Check Process will be displayed
   - If the card is not inserted, a “card not detect” message will be displayed and the SD Card process is completed.
   - If the card is inserted, “card detect” message will be displayed and sample text file will be written and read from the SD card. This would confirm the SD card initialization and communication.

     Note: You can use a card reader and see if a text file is created in the SD Card for confirmation.

5. “Press Any key” message will be displayed followed by which the TEST LED will blink for some time. Press key is for PS2 keyboard interface.

6. The TIME data is displayed continuously and will keep updating starting from 00:00:00. Make sure you have a CMOS Battery connected.

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Note:

1. If you enter any data using PS2 Keyboard, the same will be displayed on LCD.

2. If you connect a speaker or a headphone to the audio jack, you will hear a repetitive beep sound.

3. Checking Serial Port

    a. Make sure your serial port of PC is working. If you are using 9 core cable, make sure J23 jumper on LPC2148 DEV Board is removed.

    Note:

    - J23 is used during AUTO code download mode on UART0 and is used to make the microcontroller enter into programming mode. Having J23 connected and using UART0 can reset the board.

    - The second option is to use a 3 core cable which uses TX, RX and GND and J23 jumper connectivity will not be a issue at all.

    b. Open Hyper terminal and have the following setting for COM Port

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Make sure you have selected proper working COM port.

c. Connect the serial cable to UART1 of the LPC2148 Dev Board and you will see the following data displayed on hyper terminal continuously

```
Testing UART1
CoiNel LPC2148 DEV Board
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Testing UART1
CoiNel LPC2148 DEV Board
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Testing UART1
CoiNel LPC2148 DEV Board
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Testing UART1
CoiNel LPC2148 DEV Board
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Testing UART1
CoiNel LPC2148 DEV Board
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```

d. Connect the serial cable to UART0 of the LPC2148 Dev Board and you will see the POT value and LM35 temperature value displayed continuously. Following is the image of the same.

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```
UART0/ADC TEST: POT VALUE 0239 TEMPERATURE VALUE 27 deg
UART0/ADC TEST: POT VALUE 0239 TEMPERATURE VALUE 27 deg
UART0/ADC TEST: POT VALUE 0240 TEMPERATURE VALUE 27 deg
UART0/ADC TEST: POT VALUE 0240 TEMPERATURE VALUE 27 deg
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UART0/ADC TEST: POT VALUE 0239 TEMPERATURE VALUE 27 deg
UART0/ADC TEST: POT VALUE 0240 TEMPERATURE VALUE 27 deg
```

Note: `You can vary the R24 and you will see that the variations are displayed on the hyper terminal. The same is true for temperature.

10. Steps to Download Hex File through serial port

You can download the hex file in Manual mode or Auto mode

10.1. Manual ISP Programming

You need to have LPC2148 DEV Board, Serial cable (3 core or 9 core), Desktop PC, Flash Magic Software.

Follow the Steps is below:

- Power ON LPC2148 DEV Board.
- Connect Serial Cable Between UART0 of LPC2148 DEV Board and PC.
- Make sure jumper (J8) is connected towards Manual Mode.
- Make sure jumper (J23) is removed.
- Enter into the ISP Programming mode by following procedure.

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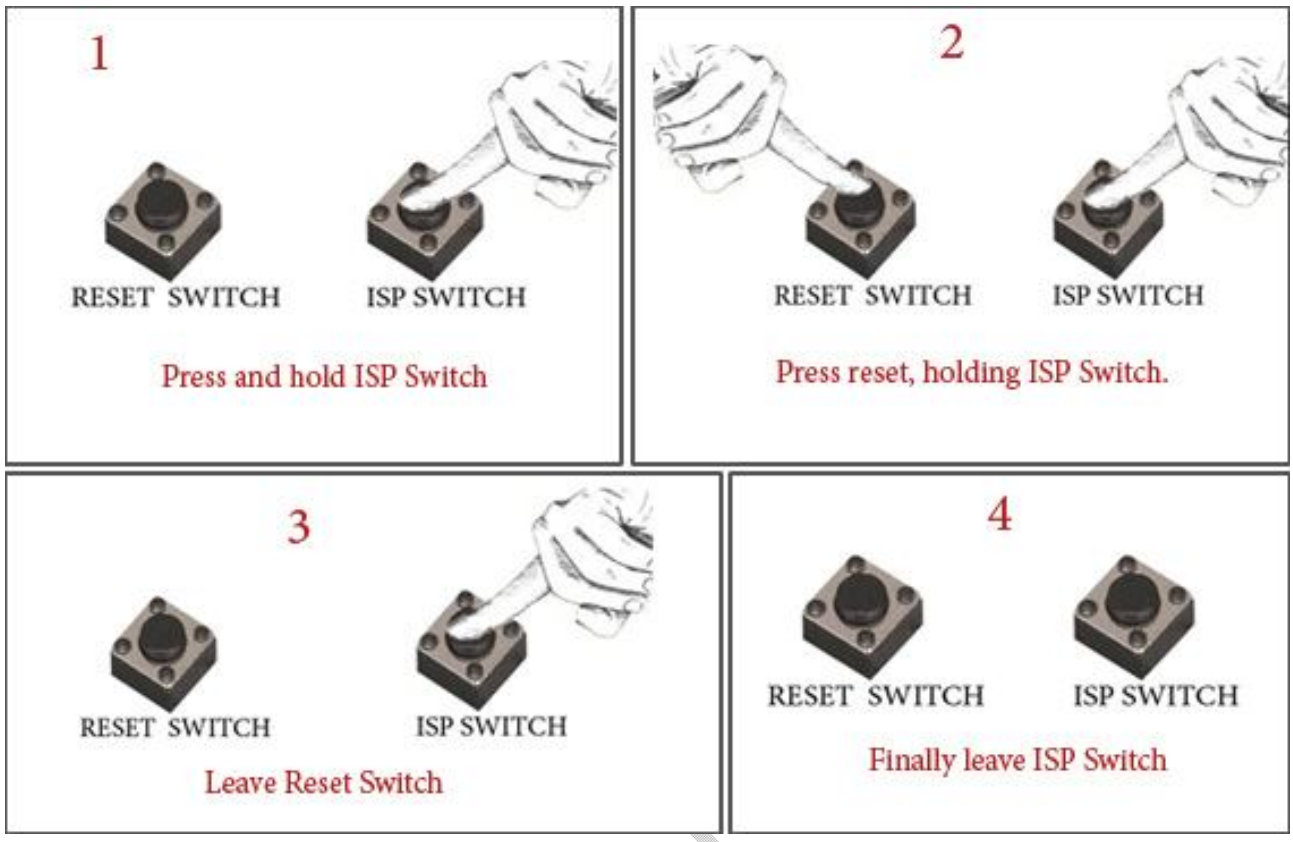
1
RESET SWITCH
ISP SWITCH
Press and hold ISP Switch
2
RESET SWITCH
ISP SWITCH
Press reset, holding ISP Switch.
3
RESET SWITCH
ISP SWITCH
Leave Reset Switch
4
RESET SWITCH
ISP SWITCH
Finally leave ISP Switch

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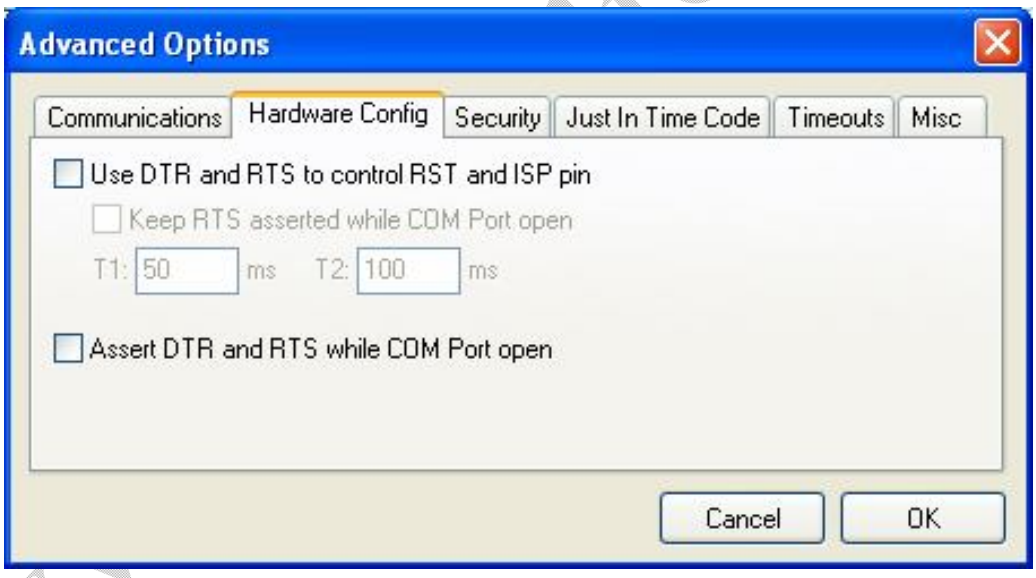
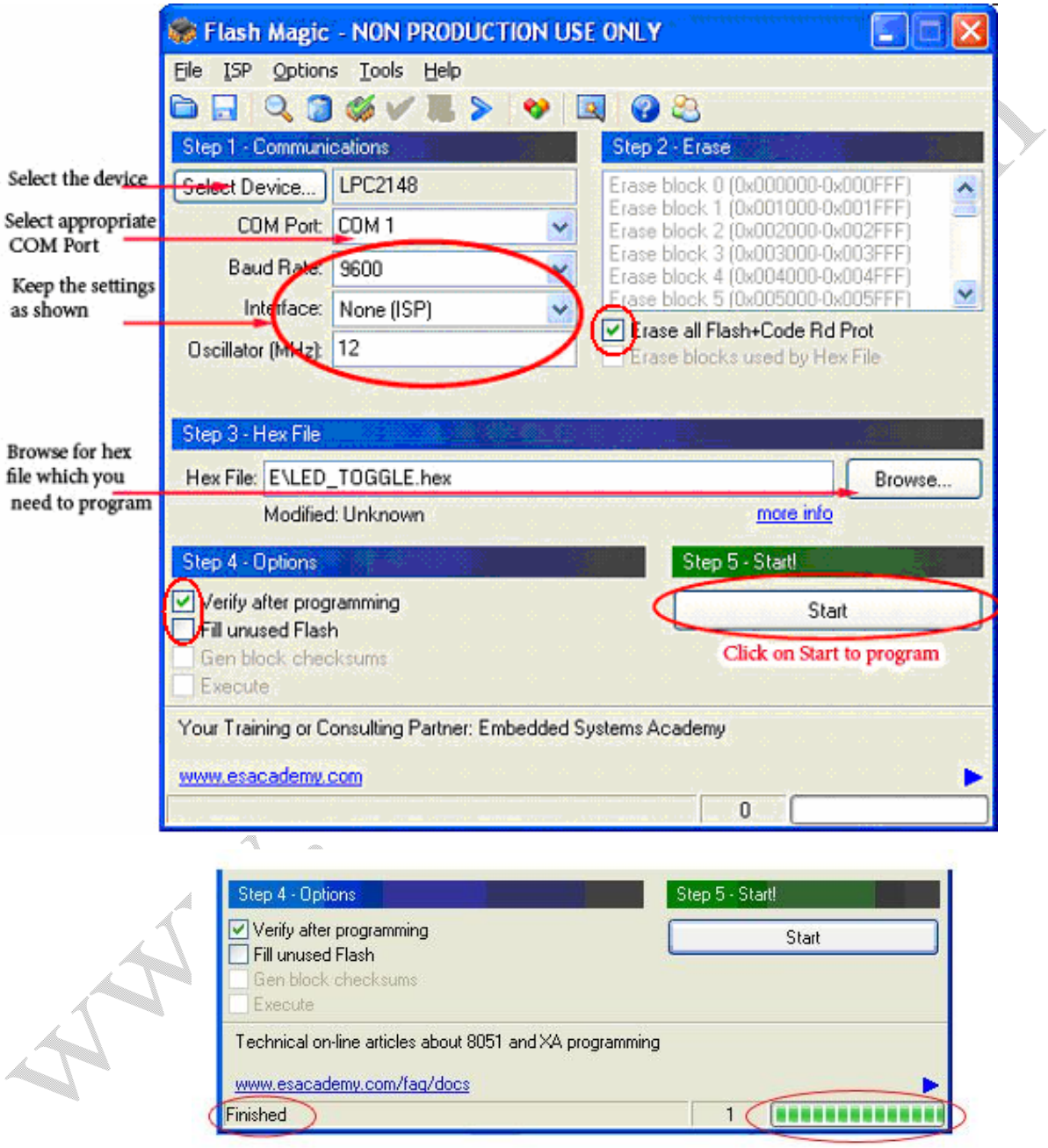
- Open Flash Magic Software in PC.
- Click on Options and select Advance Options.

- In Advance Options, make sure Use DTR and Assert DTR are unchecked.



- Click on OK after making changes if required.

- Keep the Settings as below in Flash Magic and Click on Start to program.
- COM Port may not be COM1 in every PC, Check it in Ports (COM & LPT) in Device Manager. Make sure you have connected to the proper COM port that is selected.



- If All the Settings are proper, the programming will be successful.

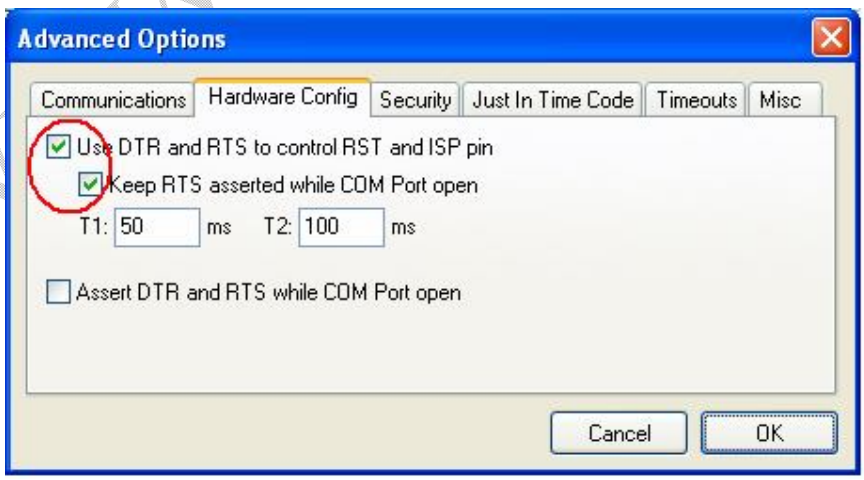
10.2. AUTO Programming

You need to have LPC2148 DEV Board, Serial cable (9 core), Desktop PC, Flash Magic Software.

Follow the Steps is below:

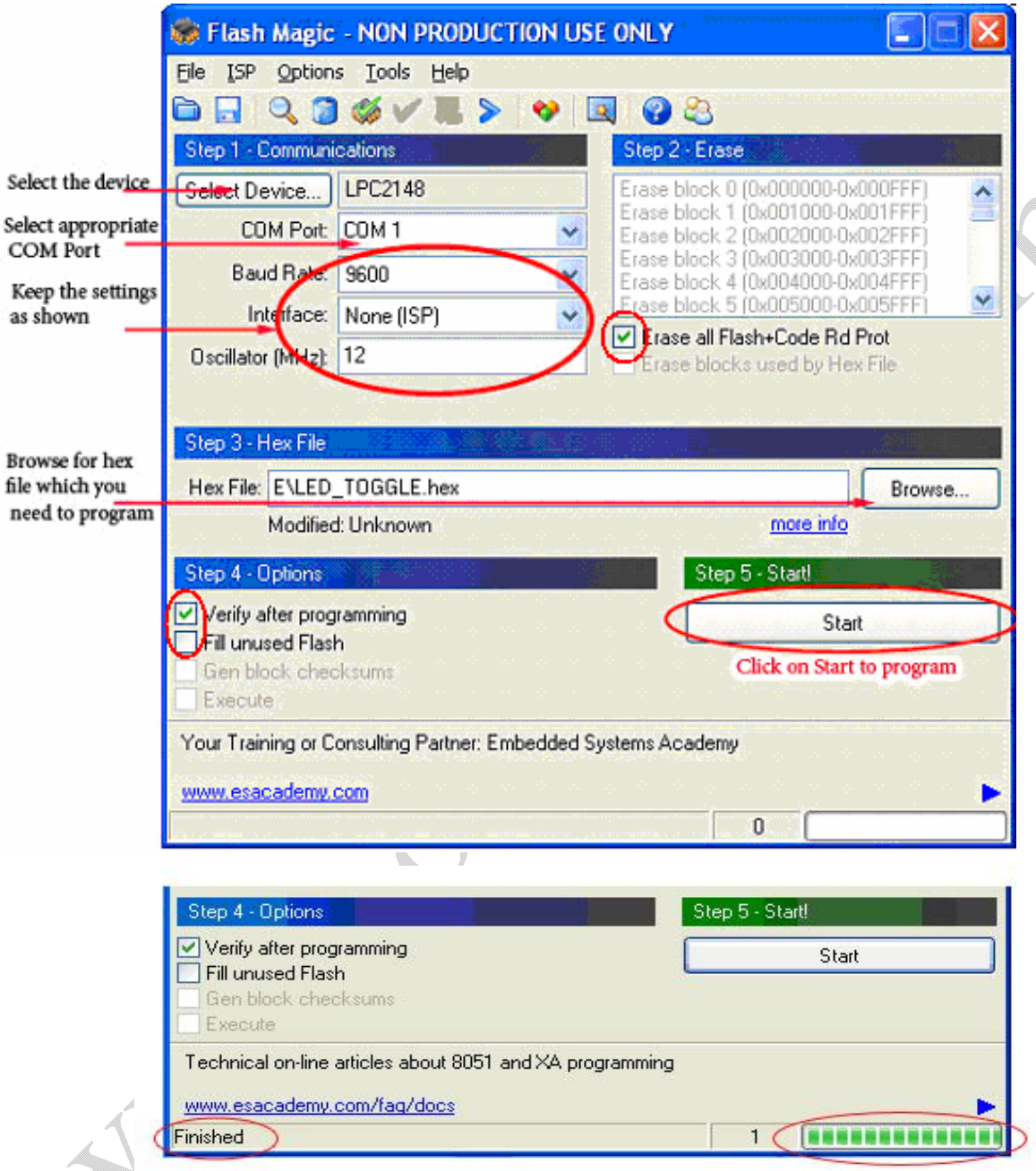
- Connect full Serial Cable (9 Core) Between UART0 of LPC2148 DEV Board and PC Serial Port.
- Make sure jumper (J8) is connected towards Auto Mode.
- Make sure jumper (J23) is connected.
- Power ON LPC2148 DEV Board.
- Open Flash Magic Software in PC.
- Click on Options and select Advance Options.

- In Advance Options Keep the Settings as shown below.



Click ok to save settings and go back to Flash Magic main page option.

Keep the settings as below in Flash Magic. After browsing the appropriate file to be loaded, click start.



- If All the Settings are proper, the programming will be successful.

Important Note:

- You need to remove jumper (J23) so that the code loaded starts executing.
- If required, you can also reset the board.

AFTER-SALE SERVICE

CoiNel is at your service, and we have special Technical Support Engineers to provide support and consultation in forms of telephone and E-mail.

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Technical Support E-mail: support@coineltech.com

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